REMARKS

Claims 1-24 are pending in this application, all of which stand finally rejected as a result of the June 16, 2006 Office Action. In particular, all claims have been rejected over U.S. Patent No. 6,233,668 (Harvey) in view of U.S. Patent App. Pub. No. 2003/0177435 (Budd). Following entry of the amendment, claim 1 will have been amended.

In the prior office action, the Examiner rejected all claims under section 102 as being anticipated by Harvey. Applicant amended independent claim 1 to recite that the page table is used to perform one "non-address-mapping action" that depends on a characteristic that is present in the page table, but not in the shadow page table. (Similar, but not identical, language was added to independent claims 5, 14, and 19.)[1] The Examiner acknowledges that this feature is not present in Harvey (see Final Rejection, pp. 3-4), and now relies on Budd (specifically, paragraph 62 of Budd) for this feature. In particular, in describing Budd the Examiner states:

> Budd et al. disclose application software that performs a non-address mapping action (comparing the stored "checksum" and the data) in paragraph 62.

Our own review of Budd shows that paragraph 62 does indeed describe that a checksum may be calculated in order to detect corruption in data.

The Examiner's position is, evidently, that computing a checksum is an example of a "non-address-mapping action," and that Budd's teaching of a checksum shows that at least one such action was known in the art as of the filing date of the present application. Applicants do not dispute that

It is worth noting that applicant has never taken the position that the checksum is novel as of the filing date of this application. No reference is necessary to demonstrate this point.

However, even if one assumes that Budd's checksum is an example of a "non-address-mapping action," the Examiner's position is incorrect for two reasons: First, it is

[1] The arguments on the various independent claims have been grouped together, solely for the Examiner's convenience. Applicant notes that the language of each independent claim speaks for itself, and the fact that the arguments on the different independent claims have been grouped together should not later be used to impute one claim's meaning to another claim.

incomplete; second, it ignores the relationship between the page table and the shadow page table as defined in the independent claims.

First, the Examiner's position is demonstrably incomplete. The Examiner states:

> Harvey et al. do not disclose expressly, "an item of software uses said page table to perform a non-address-mapping action that depends on data that a characteristic that is present in said one of the plurality of page tables but not present in said first shadow page table."

The Examiner then goes on to cite Budd for its teaching of a "non-address mapping action" (Budd's checksum is understood by the Examiner to be a specific example of a "non-address-mapping action"). However, a "non-address-mapping action" is not the only feature that the Examiner finds to be absent from Harvey. The Examiner also acknowledges that Harvey does not teach that the non-address mapping action "depends on data that [has] a characteristic that is present in said one of the plurality of page tables but not present in said first shadow page table." However, the Examiner has not addressed where this feature is found in Budd, or even why the combination of Harvey and Budd would motivate one to create this feature. In this sense, the Examiner's reliance on a combination of Harvey and Budd is incomplete, since the Examiner has acknowledged that a feature of claim 1 is not present in Harvey, but has not demonstrated where this feature is in Budd, and has not explained why a combination of Harvey and Budd would suggest this feature.

Second, the Examiner's response ignores the relationship between the page table and the shadow page table, as recited in the independent claims. For example, in claim 1 the shadow page table contains read-only links in at least one place where the page table itself contains a read/write link. The page directory points to the shadow page table instead of the page table, but there is some non-address-mapping action that depends on a characteristic of the page table itself. However, the mere citation of Budd as showing a checksum (as an example of a non-address-mapping action) entirely misses this relationship between the page table and shadow page table in claim 1 (and, for similar reasons, ignores the definition of the shadow in the other independent claims).

It is worth describing one of the reasons that a shadow page table may be used in the present application. In general, page tables can serve at least two functions. First, the main use of a page table is to translate between virtual and physical addresses. However, inasmuch

as the page table is itself a type of data, the page table can represent the state of the data in the system, and thus can be used to verify that the system's data is in an expected state. This is the "checksum" example in the application: If the page table is expected to have a certain checksum, and is discovered to have a different checksum, this fact can suggest that the data in the system (and, in particular, the data in the page table) has somehow been tampered with. Thus, some programs may compute a checksum of a page table (or otherwise check expected characteristics of the page table), and may make some action dependent on the checksum (or other characteristic) being verified in some manner. The problem is that there are some situations in which it is desirable to modify a page table, such that the page table is different from its expected state, and such modification will cause the checksum not to validate (since any modification to a block of data – no matter how slight – may change the value of the checksum on that data). One situation where it is desirable to modify a page table is where necessary to enforce a memory access policy. For example, a process may mark a page as read/write (i.e., by setting to zero the read-only bit for that page's entry in the page table). However, the memory access policy may require that particular page to be read-only (i.e., the policy may require that the read-only bit for that page be set to one). In this case, the goal of having the page table maintain its expected value is in conflict with the goal of having the page table comport with the memory access policy.

A solution of the present case is to do both, by having two separate page tables: the original, and its shadow. The shadow page table can be a modified version of the page table that comports with the memory access policy. (In claim 1, the shadow has a page marked as read-only that is otherwise marked as read/write in the real page table.) The shadow is used for actual address translation. However, if a program ever needs to determine whether the page table meets some characteristic (i.e., if it has a particular checksum), that characteristic can be determined based on the original page table. The calculation of a checksum is an example of a non-address-mapping action – in the sense that it is something other than the use of a page table to translate an address (or to locate a page that is not present in memory).

The mere mention of a checksum – as in Budd – does not teach or suggest the claimed relationship between the shadow page table and the real page table.

The above discussion refers to claim 1. While the other independent claims are defined differently from claim 1, each of the independent claims does refer to a shadow that

differs from its original in some manner, and to some non-address-mapping action that is performed using the original.

Applicants submit that the Examiner has overlooked the relevant features of the independent claims, and requests that the Examiner reconsider the rejection in light of these remarks. The mere citation of Budd as discussing a checksum does not address the features of the independent claims, as discussed above.

Claim Amendment

Claim 1 has been amended to address a minor typographical oversight. No new matter is added. The amendment does not affect the scope or meaning of the claim, and is not made to overcome any ground of rejection.

Conclusion

For all of the foregoing reasons, applicants request that the Examiner reconsider the final rejection of the claims, and allow this case.

Date: August 16, 2006

John E. McGlynn
Registration No. 42,863

Woodcock Washburn LLP
One Liberty Place - 46th Floor
Philadelphia PA 19103
Telephone: (215) 568-3100
Facsimile: (215) 568-3439